IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re:	Dale C. Flanders et al.		
Serial No:	09/804,618	Group:	2815
Filed:	03/12/2001	Examiner:	Nguyen, Joseph H.
For:		Confirmation No:	3159

Date: February 16, 2004

APPEALANTS' BRIEF

Mail Stop Appeal Brief- Patents
Assistant Commissioner for Patents
P.O. Box 1450,
Alexandria, Virginia 22313-1450

Sir:

This is the Applicants' appeal from the final Office Action, mailed June 4, 2003, (Paper No. 10).

A two-month extension of time is requested for this response.

Real Party of Interest

Axsun Technologies, Inc. is the real party in interest.

Related Appeals and Interferences

There are no related appeals or interferences.

Status of Claims

Claims 1-24 are pending in this application. Claims 1-12 stand finally rejected pursuant to the outstanding Office Action. Claims 13-22 have been withdrawn as being directed to a non-elected invention. The status of claims 23 and 24 is uncertain. These claims neither appear to be explicitly rejected nor have been indicated as containing allowable subject matter.

Status of Amendments

All amendments have been entered.

Image

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PTO/SB/21 (03-03)
Approved for use through 04/30/2003. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

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First Named Inventor	Dale C. Flanders
Art Unit	2815
Examiner Name	Nguyen, Joseph H.
Total Number of Pages in This Submission: 29	Attorney Docket Number: 1084.US

ENCLOSURES (*Check all that apply*)

- [✔] Fee Transmittal Form
- [ ] Fee Attached
- [ ] Amendment/Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
  - [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s) _____
- [ ] After Allowance Communication to a Technology Center (TC)
- [ ] Appeal Communication to Board of Appeals and Interferences
- [✔] Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
- [ ] Status Letter
- [ ] Other Enclosure(s) (please Identify below):

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual	J. Grant Houston
Signature	
Date	February 16, 2004

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, Washington, DC 20231 on this date: February 16, 2004

Typed or printed	Claire J. Handalian		
Signature	Claire J. Handalian	Date	February 16, 2004

Summary of the Invention

The present invention is directed to an optical membrane device 110. These devices are generally referred to as MEMS or micro-electro-mechanical systems. The membrane device 110 generally comprises a support 210, such as a portion of a silicon wafer. A deflectable membrane structure 214 is formed in a device layer 212. The device layer 212 is separated from the support 210 by a sacrificial layer 216. This sacrificial layer 216 is selectively removed to release the membrane structure 214.

This basic system was disclosed in U.S. Pat. No. 6,271,052 B1 to Miller, *et al.*, for example, which was cited in the instant application by Applicants, and which forms the basis for one of the pending rejections.

The innovations described in the instant application concern the formation of an optically curved surface on the deflectable membrane 214. This is shown in Figs. 4C and 4D, for example. A curved surface 250 is formed in the device layer 212 (see Fig. 4C). A reflective layer or optical coating 230 is then deposited over this curvature 250. This results in the claimed optically curved surface on the deflectable membrane, which is also on the optical axis of the device.

A number of techniques exist for forming this optically curved surface in the membrane structure. Grayscale patterning, for example, can be used.

Fig. 1 shows one implementation of the membrane structure 218 formed in the device layer 212. It also shows the optically curved surface 250, located along the optical axis 10 and the membrane device being paired with a mirror device to form a tunable Fabry-Perot filter.

The advantages of the present claimed invention over the previous approach, as described in the Miller, *et al.* patent, is that in the Miller, *et al.* system, for example, the curved surface was typically formed in the separate mirror structure which was attached to the MEMS structure as illustrated in Miller's Fig. 2 to thereby form the curve-flat Fabry-Perot filter cavity. Two patternings had to be thus performed, one for the MEMS device and one for the separately attached mirror device.

In contradistinction, in the present claimed invention, most of the processing is directed at the membrane device. Thus, a curved flat Fabry-Perot optical cavity can be formed with flat mirror device 112. Additionally curved-curved cavities and deflectable lenses can also be manufactured with this inventive technology.

Issues

1. Whether claims 1-12 are unpatentable under 35 U.S.C. 102(e) as being anticipated by Miller, *et al.* (US 6,271,052)
2. Whether claims 1-3 and 5-6 are unpatentable under 35 U.S.C. 102(b) as being anticipated by Tayebati, *et al.* (WO 99/34484).

Grouping of Claims

Claims 1-12 stand or fall separately from each other.

Argument

Claim 1 is not anticipated by the Miller, *et al.* patent. Claim 1 requires "an optically curved surface on the deflectable membrane and on an optical axis of the optical membrane device." The Miller, *et al.* patent does not show an optical curvature to its membrane layer 125, and certainly so such curvature in the center body portion 156 of its patterned polysilicon membrane 125'. Specifically, the patterned polysilicon membrane 125' shown in Fig. 2 of the Miller, *et al.* patent is flat and does not have an optically curved surface as claimed.

Further, the dependant claims require additional features that are neither shown nor suggested by the Miller, *et al.* patent. Specifically, claim 2 describes that the optical surface is formed in an optical element layer that is deposited on the device layer. Claim 3 requires that the optical surface is etched into the device layer of the deflectable membrane. Claim 4 requires that the concave surface is formed in the device layer. Again, the Miller, *et al.* patent shows a patterned device layer 125', which is flat.

Claim 5 requires a convex surface, which is not shown by the Miller, *et al.* patent. Claim 12 requires that the optical surface is an anti-reflective coating. In contrast,

material 140, on the patterned membrane 125', shown in Fig. 2 of the Miller, *et al.* patent, is a mirror layer.

Thus, for the foregoing reasons, Applicants respectfully believe that the rejected claims are not anticipated by the Miller, *et al.* patent.

Claims 1 is not anticipated by the Tayebati, *et al.* application. Claim 1 requires "a sacrificial layer separating the support from the device layer, the sacrificial layer being selectively removed to release the membrane structure." This relates to the removal of layer 216, as shown in, for example Fig. 4C of the instant application, to thereby release the membrane 218.

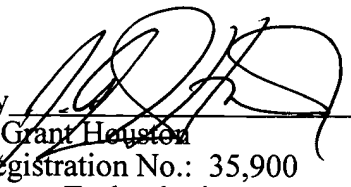
The most relevant portion of the Tayebati application was identified as its Fig. 3F. And, the Tayebati, *et al.* application has a similar sacrificial layer 30, as recognized by the pending Office Action. This sacrificial layer, however, is not selectively removed as claimed. Instead, as shown by the process flow between Figs. 3E and 3F, of the Tayebati application, the sacrificial layer 30 is completely removed in order to release the membrane 12. Thus, claim 1 is neither shown nor suggested by the Tayebati, *et al.* application.

Further, claim 3 requires that the optically curved surface is etched into the device layer. The Tayebati, *et al.* application discloses a different technique for creating its curved upper mirror membrane 12. Specifically, material stress is used to induce its curvature. Thus, the curved optical surface is not etched into the device layer as claimed in claim 3, for example.

For similar reasons, the Tayebati, *et al.* application does not describe that the optical surface is etched into the device layer as required in claim 5.

For the foregoing reasons, Applicants believe that the pending rejections should be withdrawn, and that the present application should be passed to issue. Should any questions arise, please contact the undersigned.

Respectfully submitted,



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Appendix

1. (previously amended) An optical membrane device comprising

a support;

a device layer in which a deflectable membrane structure is formed;

a sacrificial layer separating the support from the device layer, the sacrificial layer being selectively removed to release the membrane structure; and

an optically curved surface on the deflectable membrane and on an optical axis of the optical membrane device.

2. (original) An optical membrane device as claimed in claim 1, wherein the optical surface is formed in an optical element layer that is deposited on the device layer.

3. (original) An optical membrane device as claimed in claim 1, wherein the optical surface is etched into the device layer.

4. (previously amended) An optical membrane device as claimed in claim 1, wherein the optical surface is a concave surface that is formed into the device layer.

5. (original) An optical membrane device as claimed in claim 1, wherein the optical surface is a convex surface that is etched into the device layer.

6. (original) An optical membrane device as claimed in claim 5, wherein the sacrificial layer defines an electrical cavity across which electrical fields are established to deflect the membrane structure in a direction of the support.

7. (original) An optical membrane device as claimed in claim 6, wherein the membrane structure comprises:

a center body portion;

an outer portion, which is at least partially supported by the sacrificial layer; and

tethers that extend between the center body portion and the outer portion.

8. (original) An optical membrane device as claimed in claim 1, wherein the sacrificial layer defines an electrical cavity across which electrical fields are established to deflect the membrane structure in a direction of the support.

9. (original) An optical membrane device as claimed in claim 1, wherein the membrane structure comprises:

a center body portion;

an outer portion, which is at least partially supported by the sacrificial layer; and

tethers that extend between the center body portion and the outer portion.

10. (original) An optical membrane device as claimed in claim 1, further comprising an optical coating deposited over the optical surface.

11. (original) An optical membrane device as claimed in claim 10, wherein the optical coating is multilayer dielectric mirror.

12. (previously amended) An optical membrane device as claimed in claim 10, wherein the optical coating is an antireflective coating.

13. (withdrawn) A process for fabricating an optical membrane device, comprising

providing a support;

forming a sacrificial layer on the support;

forming a device layer on the sacrificial layer;

patterning a membrane structure into the device layer;

releasing the membrane structure by selectively removing the sacrificial layer; and

forming an optically curved surface on part of the membrane structure of the device layer.

14. (withdrawn) A process as claimed in claim 13, wherein the step of forming the optical surface comprises:

depositing a photoresist layer;

reflowing the photoresist layer to create a curved surface; and

transferring the curved surface into the device layer by etching the photoresist and the device layer.

15. (withdrawn) A process as claimed in claim 14, wherein the step of reflowing the photoresist comprising reflowing a columnar photoresist layer to form a convex surface.

16. (withdrawn) A process as claimed in claim 14, wherein the step of reflowing the photoresist comprising reflowing a photoresist layer to create a concave surface via surface tension in the reflowed photoresist.

17. (withdrawn) A process as claimed in claim 13, further comprising depositing a highly reflective coating over the curved optical surface.

18. (withdrawn) A process as claimed in claim 13, further comprising depositing a dielectric mirror coating over the curved optical surface.

19. (withdrawn) A process as claimed in claim 13, further comprising depositing an antireflective coating over the curved optical surface.

20. (withdrawn) A process for fabricating concave mirror structures, comprising an optical membrane device, comprising

depositing a photoresist layer over a well in a substrate;

transferring curved surface over the well into the substrate by etching the photoresist and the substrate; and

coating a curved surface of the substrate with a dielectric mirror coating.

21. (withdrawn) A process as claimed in claim 20, further comprising providing the substrate with the well by forming a patterned layer, in which the well is formed, over a device layer.

22. (withdrawn) A process as claimed in claim 20, further comprising providing the substrate with the well by forming the well in a device layer.

23. (previously added) An optical membrane device as claimed in claim 1, wherein the optically curved surface of the deflectable membrane is centered on the optical axis of the optical membrane device.

24. (previously added) An optical membrane device as claimed in claim 1, wherein the optically curved surface of the deflectable membrane is centered on the deflectable membrane.